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ABSTRACT

The work of the National Research Center on Student Learning (CSL) is described. The CSL, one of 23 national centers funded by the Office of Educational Research and Improvement, is an integral part of the Learning Research and Development Center of the University of Pittsburgh (Pennsylvania). The CSL conducts interdisciplinary research that informs and supports thinking-oriented education in the United States. CSL studies how instruction can encourage students to: (1) ask questions about what they learn; (2) invent new ways of solving problems; (3) connect new knowledge to information they already have; and (4) apply their knowledge and reasoning skills in new situations. Research focuses on metacognitive processes that teachers can nurture and encourage students' regulation of their own learning, and critical thinking and the elaboration of problems. The CSL is also working to build a knowledge base about the reasoning styles that are characteristic of different school subjects (history, science, geography, mathematics, and social sciences). Other lines of research explore: (1) domain-specific education; (2) students' prior knowledge; (3) social contexts of learning; and (4) connections between higher order learning skills and persistence or motivation. CSL research projects are organized into the three areas of: (1) strategies for thinking; (2) knowledge foundations for thinking; and (3) thinking in the classroom. (SLD)

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NATIONAL RESEARCH CENTER ON STUDENT LEARNING

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National Research Center on Student Learning

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The National Research Center on Student Learning (CSL) focuses on how thinking skills affect what students learn in school. One of 23 national centers funded by the Office of Educational Research and Improvement, CSL is an integral part of the University of Pittsburgh's Learning Research and Development Center (LRDC). LRDC's mission is to conduct fundamental research on learning and to construct scientific foundations for education and training.

What Are CSL's Goals?

In more and more dimensions, modern society asks us to think critically, take initiative and responsibility, devise goals and strategies, and grapple with intricate concepts that affect our quality of life and work. For example, the demands of a changing workplace require all American citizens, not just a fortunate few, to develop higher level thinking and problem-solving skills, not just basic competency in reading and computation. Similarly, a grasp of complicated social and political issues requires us to interpret, question, and evaluate the terms in which social issues are expressed or argued.

CSL conducts interdisciplinary research that informs and supports thinking-oriented education in the United States. Modern cognitive research has shown that instruction must do more, even at elementary levels, than directly convey factual information. CSL studies how instruction can encourage students:

- to ask questions about what they learn,
- to invent new ways of solving problems,
- to connect new knowledge to information they already have, and
- to apply their knowledge and reasoning skills in new situations.

What Kinds of Research Does CSL Do?

CSL research advances our progress toward thinking-oriented education. Instead of devising specific cognitive strategies that teachers cannot always convey directly, researchers are reformulating concepts of general learning and thinking skills. Focusing on metacognitive processes that teachers can nurture and encourage, this work explores two processes that significantly enhance learning:

- students' regulation of their own learning and
- critical thinking and the elaboration of problems.

Other CSL projects provide knowledge that can help educators to teach thinking and reasoning in specific disciplines. Each subject area has characteristic ways of reasoning and problem solving, and a thinking curriculum would expose students to all styles of thought and exploration. CSL is working to build a substantial base of knowledge about the reasoning styles characteristic of different school subjects—history, science, geography, mathematics, and social science. CSL also investigates the nature and scope of learning skills that apply across domains.

Researchers are exploring and analyzing the strengths and weaknesses of various aspects of instruction:

- teacher explanations,
- textbook presentations,

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- laboratory experimentation,
- model-based reasoning, and
- applications of scientific theory.

This research in domain-specific education will help CSL work with classroom teachers in developing instruction that can shape proficient thinking.

Because knowledge provides the content for reasoning, CSL also studies how knowledge itself develops and how students can best learn to construct and use it actively. Researchers are studying how students' prior knowledge—the preconceptions and mental models they derive from ordinary experience and bring with them to the classroom—supports or impedes the knowledge and insight they build in a domain. Other scientists are exploring key concepts that organize large amounts of information in any discipline and make it accessible to learners.

Many lines of CSL research also share an interest in the social contexts of learning. CSL researchers are:

- studying group discussions and the effects of conflicting opinions among group members,
- comparing discourse patterns in student teams with those in teacher-led discussions, and
- engaging students and teachers in collaboratively revising and improving texts.

Finally, several CSL research projects are exploring the connections between higher order learning skills and persistence, or motivation. A basic premise of is that motivation will rise in direct proportion to students' active cognitive engagement. To demonstrate this connection, researchers are studying:

- text revision,
- reasoning in history,
- discovery and argumentation in mathematics,
- the construction of explanations in science, and
- socially shared learning.

Although CSL research projects share a theoretical base and many methods and implications for practice, they are organized into three broad programs. Each of the following programs encompasses several projects:

- **Strategies for Thinking** investigates the nature of potentially teachable thinking and reasoning strategies. Projects focus on strategies that apply broadly to learning, with special attention to how students monitor and manage their own learning from texts and to processes of dialectical reasoning and argumentation.

- **Knowledge Foundations for Thinking** focuses on several school disciplines, revealing their core knowledge structures. Projects examine students' prior knowledge and seek to identify powerful forms of instruction that take this knowledge into account.

- **Thinking in the Classroom** studies learning in various classroom settings. Projects analyze exemplary teaching, the structure of classroom activity and discourse, and learning outcomes. Projects also examine instruction from elementary grades through high school in science, history, and mathematics.

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